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U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1398

CcurrANTS AND GOOSEBERRIES

THEIR CULTURE AND RELATION TO WHITE-PINE BLISTER RUST

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THE CURRANT AND GOOSEBERRY INDUSTRY must be considered in connection with the preservation of our valuable white-pine timber. The white pines are a great national asset, essential to forestry development in this country.

White-pine blister rust threatens to destroy these forests. This disease is caused by a destructive fungus of foreign origin recently introduced here. It must first grow on the leaves of currant or gooseberry bushes before it can attack and kill the pines. The pines in an infected area can be protected from further damage from the rust only by removing all currant and gooseberry bushes from the area. Because of the blister rust, the culture of currants and gooseberries is restricted or prohibited in regions where the eastern and western white pines, sugar pine, and other five-needle (white) pines are important.

Cultivated black currants, sometimes called the European or English black currant (*Ribes nigrum* L.), are more susceptible to white-pine blister rust than any other type of currant or gooseberry. This species is the most active agent concerned in the long-distance spread and establishment of the disease. That is, cultivated black-currant plants become heavily infected at great distances from diseased pines, and because of their extreme susceptibility to the rust they establish centers of infection from which the disease spreads rapidly to other kinds of currants, gooseberries, and white pines.

Compared to cultivated black currants, other species of currants and gooseberries are relatively resistant to blister rust. However, in the course of a season, the disease may spread on any type of currant or gooseberry from the original black-currant center, because of successive cycles of the summer stage of the rust.

The United States Department of Agriculture recognizes the cultivated black currant as a distinct menace to the white-pine timber supply of the country. It is a menace not only to the thousands of farm owners who grow white pine in their wood lots or in their shelter belts and dooryards but also to all citizens, since all use white-pine lumber directly or indirectly. The common cultivated black currant is so serious a danger to the production of white-pine timber as to make this currant a public nuisance in all States where white (five-needle) pines grow. The department is opposed to the growing of this species of currant (*Ribes nigrum*) anywhere in the United States and recommends that State authorities, nurserymen, and growers take active steps to accomplish its elimination from the Pacific, Rocky Mountain, Atlantic, Appalachian, Ohio Valley, upper Mississippi Valley, and Lake States.

The growing of cultivated black currants, in home gardens as well as in nurseries and commercial plantings, should be entirely abandoned throughout these States, because of the great importance of the white pines and the relatively small value of the black currants.

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Currants and Gooseberries

Washington, D. C. August, 1924

CURRANTS AND GOOSEBERRIES: THEIR CULTURE AND RELATION TO WHITE-PINE BLISTER RUST.

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REGIONS WHERE CURRANTS AND GOOSEBERRIES CAN BE GROWN.

FOUR FACTORS limit the growing of currants and gooseberries in the United States: The heat of summer, the lack of moisture, the white-pine blister rust, and the currant maggot.

Both currants and gooseberries are natives of cool, moist northern climates and in the United States succeed best in the northern half of the country and east of the one hundredth meridian. They are injured by the long hot summers of the Southern States, except in the higher altitudes of the Appalachian Mountains. Even in Missouri and Kansas they do not succeed very well. They are not adapted to the hot interior valleys of California, but are grown in the northern coast counties of that State. Figure 1 shows the approximate southern limit for the commercial culture of these fruits.

Gooseberries are grown slightly farther south than currants and seem to endure the summer heat somewhat better. More spraying, however, is necessary to keep the foliage of currants and gooseberries in a healthy condition in the southern part of their range than in the northern part.

Currants and gooseberries are very hardy and withstand extremely low temperatures; in fact, if windbreaks are provided, most varieties are able to withstand the severe conditions in most parts of the upper Mississippi Valley and the northern Great Plains area.

In the region west of the one hundredth meridian, limited rainfall restricts their culture materially, except in irrigated sections and in comparatively small areas in northern California, the Willamette Valley, and the Puget Sound region.

The blister rust makes it necessary to destroy currant and gooseberry plants already growing and to prevent new plantings wherever the white pine is an important forest tree and there is danger of that disease being spread to valuable forest areas (see p. 18).

The fruitworms, especially the currant maggot, are very serious pests on currants and gooseberries in the Mountain and Pacific Coast States and have made the production of these fruits difficult in many sections there. The currant maggot, for which there is no known means of control, occurs also in some localities in the Eastern States. Some very productive and profitable plantations may be found in the area designated as *c* in Figure 1, and small plantings are scattered throughout the whole area, but until local conditions have been investigated, currants and gooseberries should not be planted commercially in that part of the country.

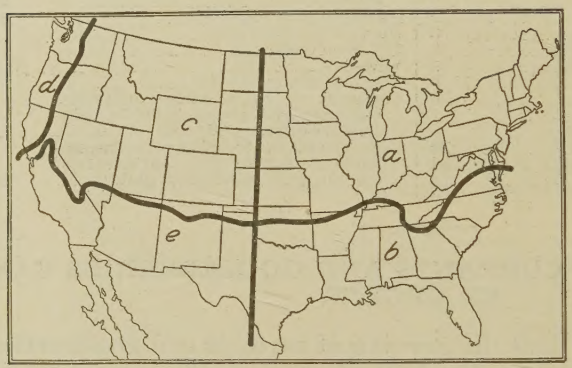

FIG. 1.—Outline map of the United States, showing the regions where currants and gooseberries may be grown. The area marked *a* is naturally best adapted to currants and gooseberries; in *b* the summers are too long and too hot for these fruits; in *c* low rainfall limits their culture except under irrigation, though these fruits are planted in many dry-land fruit gardens throughout this region. Although the area marked *d* has sufficient rainfall for these fruits, most of the rain occurs during the winter months and the moisture must be carefully conserved, while *e* is both too dry and too hot in summer. The boundaries of these areas are not sharply defined, but grade imperceptibly into each other.

SOIL AND SITE FOR A PLANTATION.

The soil selected for the currant and the gooseberry should be cool, well drained, and fertile. The heavy types, such as silt or clay loams, are usually better in these respects than sandy soils. Neither fruit will do well on land where water stands during any part of the year.

In regions toward the southern limit of their culture, it is best to select a northern or northeastern slope, in order to give some protection from the sun. The north side of a building may be selected when only a few plants are to be grown for home use.

A place with good air drainage is preferred for gooseberries. In low, damp places, mildew attacks both fruit and foliage more severely than on higher sites where the air circulation is better. Currants, however, are seldom severely attacked by mildew. Therefore, when the site is a sloping one, currants may be planted on the lower parts and gooseberries above. As both fruits blossom very early in the spring, neither should be planted in low pockets where late spring frosts may kill the flowers.

PREPARATION OF THE SOIL.

Before planting, the soil should be prepared as for garden crops. This includes deep plowing and thorough harrowing. Recently plowed sod land should not be used, as a rule, because the sod will

interfere with the setting of the plants and the management of the plantation until it becomes completely rotted. Sod land plowed early in the autumn and replowed and harrowed the following spring will usually be in good condition for planting, as will land in a good state of fertility following a crop of potatoes, tomatoes, or some other hoed crop.

PROPAGATION OF THE PLANTS.

Plants of the varieties desired generally can be obtained from reliable nurserymen at small cost, and this is a satisfactory way to obtain them either for the home fruit garden or for commercial planting. They may be propagated in the home garden, however, by means of layers or cuttings.

FIG. 2.—A field of gooseberries mounded for propagation by layers. About July 1 the bushes are mounded with soil at least half way to the ends of the branches, following which roots begin forming along the branches. All those which are well rooted may be cut off from the parent plant in the autumn or following spring and grown in the nursery row for one season, or perhaps two seasons, before being permanently planted. (Photographed at Fredonia, N. Y., August 10, 1917.)

Gooseberries ordinarily are propagated by mound layers. The plant from which layers are to be taken should be cut back heavily before it begins to grow in the spring. By July it will have sent out numerous vigorous shoots. It should then be mounded with earth half way to the tips of the shoots, as shown in Figure 2. By autumn the shoots will have rooted. Those with strong roots may then be cut off and set in the nursery, to be grown for one or two years before planting in the field. If the roots are not well developed, it will be better to leave the shoots attached to the parent plant for a second year. They will make strong root systems meanwhile, and then, if grown for a year in the nursery after being cut from the parent plant, they will be satisfactory for planting. The latter method is more common with European varieties, which do not root so readily as the American sorts.

A few varieties of gooseberries are propagated more easily by cuttings than by layers. Those varieties which are of European

parentage are generally the most difficult to propagate by cuttings. American sorts vary greatly in this respect, however. Thus, cuttings of the Houghton variety root readily, while those of the Downing do not. Two new and as yet little-known varieties, the Poorman and the Van Fleet, are easily propagated by cuttings. If cuttings are used, they should be of the current season's growth and about 8 inches long, and they should be handled in accordance with the directions here given for currant cuttings.

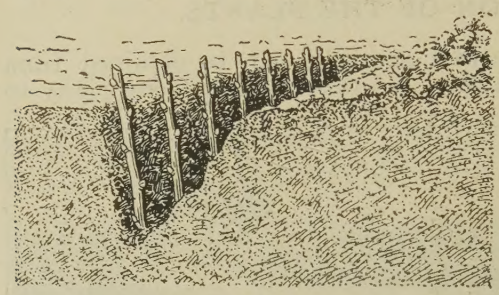

FIG. 3.—Cuttings set in trench.

Currants are propagated almost entirely by means of cuttings made from vigorous shoots of the current season's growth.

In the Eastern States cuttings are made about 8 inches long and in the Pacific coast regions from 10 to 12 inches long. They are usually cut in the autumn after the leaves have dropped and may be set in the nursery row immediately, or buried in sand with the bottom end up, or stored until spring in a cellar cool enough to keep them dormant and moist enough to prevent drying, but not so moist as to cause mold to develop on them. The cuttings may also be made during the winter or in early spring. In the latter case, they are put in the nursery at once. The cuttings should be set from 3 to 6 inches apart in the nursery row, with the soil firmly packed about them. This is done as early in the spring as the soil can be worked, whether

FIG. 4.—A Cherry currant bush at Fredonia, N. Y., the entire annual growth of which has been cut off each year at the surface of the ground for use as cuttings. This practice insures the maximum growth of new wood for cuttings the following year. Nurserymen may get as many as 100 cuttings from a single bush. (Photographed August 10, 1917.)

the cuttings are made in the autumn or later. Not more than two buds should be left above the ground. Figure 3 shows cuttings placed in a trench ready to have the soil packed about them. At the end of one or two seasons they should make plants satisfactory for setting in the field. Figure 4 shows a currant bush used for propagation. All the new wood is removed each year to make cuttings.

HANDLING NURSERY STOCK.

Only strong 1-year-old or 2-year-old plants should be used for field planting. Unless the plants can be set at once upon arrival from the nursery, the bundle should be opened and the plants separated and heeled in, as shown in Figure 5. This will protect the roots from drying. If the roots are very dry when the plants are received, they should be soaked for several hours before heeling in. Figure 6 shows a bundle of gooseberry plants as received from the nursery.

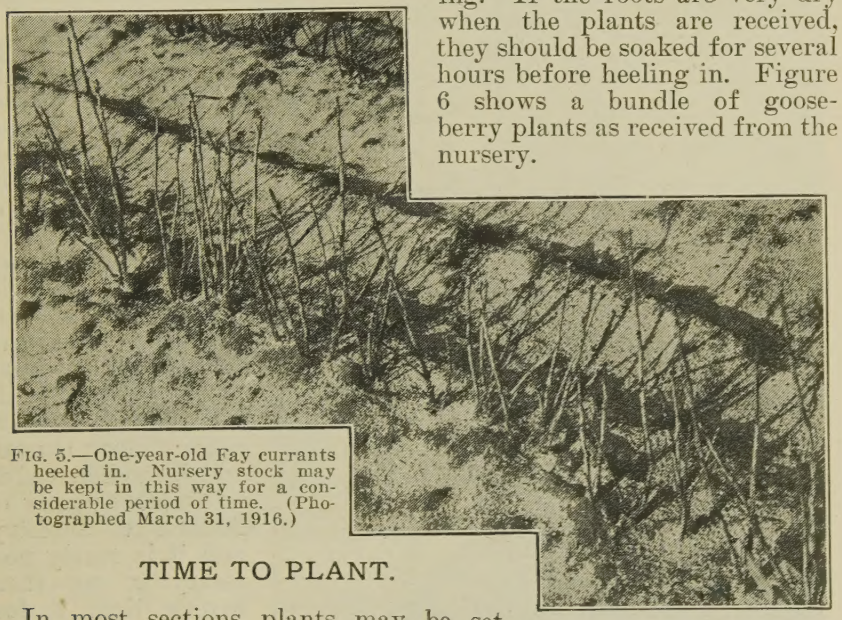

FIG. 5.—One-year-old Fay currants heeled in. Nursery stock may be kept in this way for a considerable period of time. (Photographed March 31, 1916.)

TIME TO PLANT.

In most sections plants may be set either in the autumn or spring, but in northern Iowa and Nebraska and the States north of them only spring planting should be practiced. Both currants and gooseberries start growth very early in the spring, and if nursery stock can be secured in the autumn, the fall season is preferred for planting except in the section just mentioned. In order that the roots may become thoroughly established in the soil before winter, the plants should be set as early as it is possible to obtain them in a dormant condition. Currants may be planted as early as the middle of September in the Northern States, except as noted above, and gooseberries as early as October 1. It is often difficult, however, to purchase plants for autumn setting.

DISTANCE TO PLANT.

Spacing of the rows depends mainly on the type of tools that are to be used for cultivation. If a 1-horse cultivator is to be used, the rows should be set 6 feet apart, while for a 2-horse cultivator the rows should be 8 feet apart.

The distance between the plants in the rows depends to a considerable extent on the variety. If the bushes are of a variety that does not grow large, they may be set as close as 4 feet, while if the bushes are naturally large when fully grown, or the ground is very rich, 5 or 6 feet apart is preferred. The bushes of the Wilder, London, and some other red currants grow larger than those of the Perfection, Fay, and Red Cross varieties, and should be set farther apart in the row. Therefore, if in any section Red Cross bushes are commonly set 5 feet apart in the row the Wilder bushes should be at least 6 feet apart.

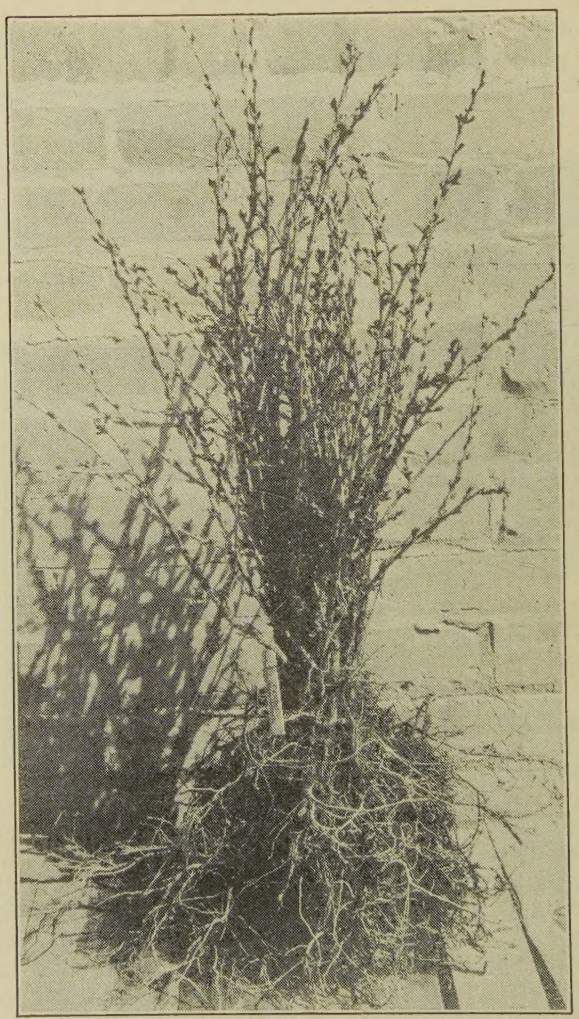

FIG. 6.—A bundle of 27 good plants of the Carrie gooseberry as received from the nursery.

The Downing, Houghton, Oregon, and Poorman gooseberries have larger bushes than most others. They may be set 4 or 5 feet apart in soil of ordinary fertility, but in very fertile soil they will need to be 6 or 7 feet apart. Gooseberry bushes of European parentage usually do not grow as large as those mentioned, which are believed to be at least partly of American ancestry, and it is rarely necessary to set them more than 5 feet apart.

DIRECTIONS FOR PLANTING.

Before planting, all broken roots should be cut off and the top cut back to stand about 6 inches above the ground. If the plants have especially strong root systems the tops may be left 10 to 12 inches high. The plants should be set somewhat deeper than they stood in the nursery. If they do not branch naturally near the surface of the ground, they should be set so deep that the lowest branch starts just below the surface of the soil. This will cause them to take the form of a bush instead of a small tree.

The soil must be packed firmly about the roots with the foot as the plants are set. Without such packing the roots may dry out and the plants die.

In friable soils, such as fine sandy loams, the hole for planting may be made by forcing a spade straight down and then pressing it forward. The roots are thrust into this hole, the spade withdrawn, and the soil firmed about them. Plants can be set very rapidly in this manner. In heavy soils holes may have to be dug with a spade before planting. The cost is then much greater than by the former method, but unless the holes are dug the clay may harden about the roots so that the plants will not grow well.

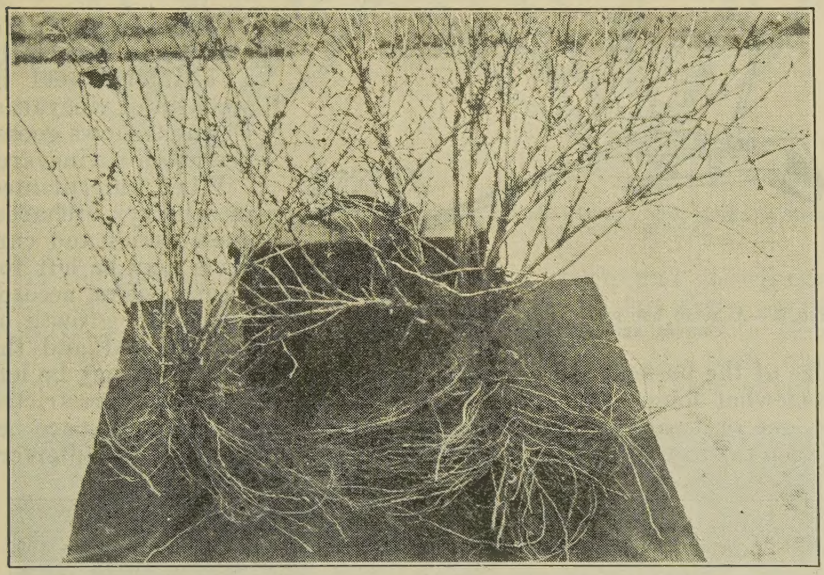

FIG. 7.—An old gooseberry plant (at the right), showing the character of its root system. The plant at the left grew from the tip of one of its branches, which was covered with soil. (Photographed September 26, 1916.)

TILLAGE AND MULCHING.

Tillage should begin soon after the plants have been set and should be continued at frequent intervals throughout the growing season or until a green-manure crop is planted. The tillage should be deeper the first year than later.

Both currants and gooseberries usually are shallow rooted, and care must be taken not to injure the roots in tillage. If a cultivator is run rather deep the first year the roots may be made to grow somewhat deeper than they otherwise would. The first spring cultivation should be deeper than later ones. Growers sometimes use a plow at this time.

Figure 7 shows the root systems of gooseberry plants grown on land properly tilled. Some of the roots were not more than 6 inches below the surface, but many were over a foot deep.

If plants are set 5 or more feet apart each way a horse cultivator may be used, and very little hand hoeing will be necessary. If they

are set so that the cultivator can be run in one direction only and the rows are 7 or 8 feet apart, a horse hoe, such as is shown in Figure 8, may be used. This is easily guided, and if used in connection with the cultivator will reduce the amount of hand labor very considerably.

A mulch of straw or wild hay is sometimes advised for currants and gooseberries. It conserves moisture, keeps down weeds, and takes the place of tillage. Mice are likely to nest in mulched fields, however, and girdle the plants; in fact, the injury from this source is so often serious that growers rarely use a mulch.

INTERPLANTING AND INTERCROPPING.

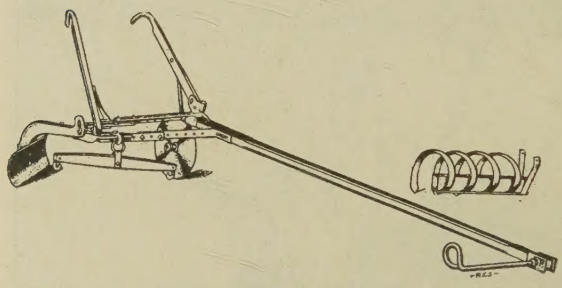

FIG. 8.—A horse hoe which may be used to advantage in currant and gooseberry plantations.

Gooseberries and currants frequently are interplanted in orchards or vineyards. Figure 9 shows gooseberries in a vineyard.

When interplanted in cherry orchards, gooseberries and currants may be left for several years, according to the growth of the orchard and the size of the bushes; and in apple and pear orchards they may be left somewhat longer, though the ground occupied should be restricted to one or two rows of bushes through the center of the space between the tree rows. Otherwise, the bushes will be likely to interfere

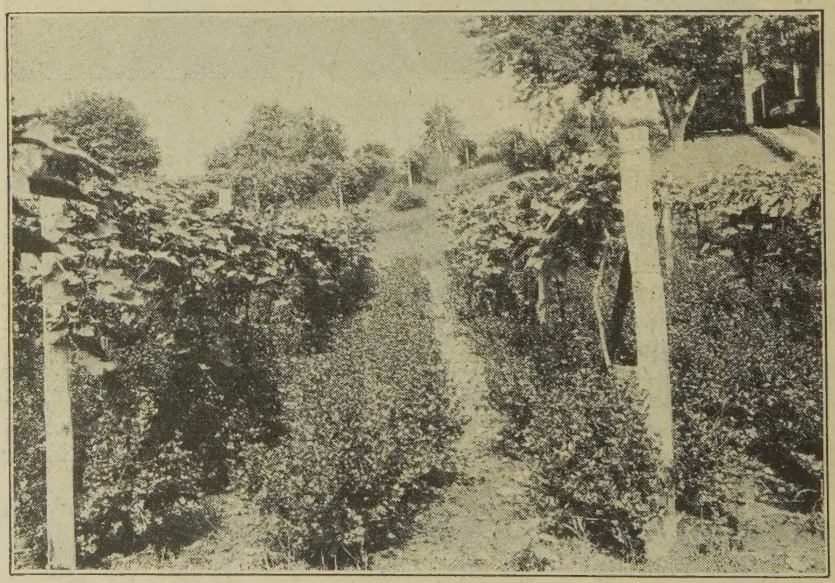

FIG. 9.—Gooseberries interplanted in a vineyard at Marlboro, N. Y. A row of gooseberries is set between the rows of grapes and another row under the grape trellis. These grape rows are 9 feet apart. (Photographed July 20, 1917.)

with the proper care of the trees. In vineyards, the currants and gooseberries are often made a part of the permanent plantation, but while they are commonly productive when so grown, the grapes are likely to be rather unproductive.

FIG. 10.—A currant bush before pruning.

FIG. 11.—The currant bush shown in Figure 10 after pruning.

In the gardens where space is limited, currants and gooseberries may well be planted among the tree fruits and left there permanently. The shade of the trees protects the fruits from sun scald, and the foliage is usually healthier in such locations than when grown where it is freely exposed to the sun. The shade afforded

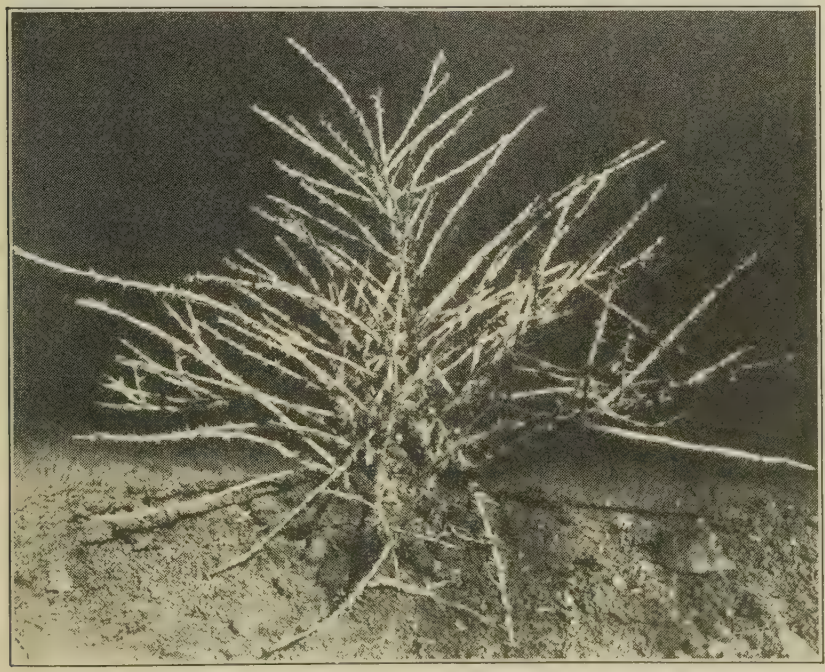

FIG. 12.—A gooseberry bush before pruning. (Compare with Figure 13.)

by the fruit trees will be especially beneficial in southern sections, and the currants and gooseberries should be even more productive than if planted by themselves.

When currants and gooseberries are not grown in orchards they may be intercropped for the first two years; that is, vegetables may be grown between the plants in the rows and between the rows. Lettuce, early potatoes, early cabbage, and other early crops requiring intensive cultivation are especially suitable for this purpose. The thorough tillage required by the vegetables is also needed by the berry plants, and the intercrop will often pay for all expenses connected with the care of the plantation.

MAINTENANCE OF FERTILITY.

Both the currant and the gooseberry respond well to the use of fertilizers, even when planted on fertile soils. Their use, however, is

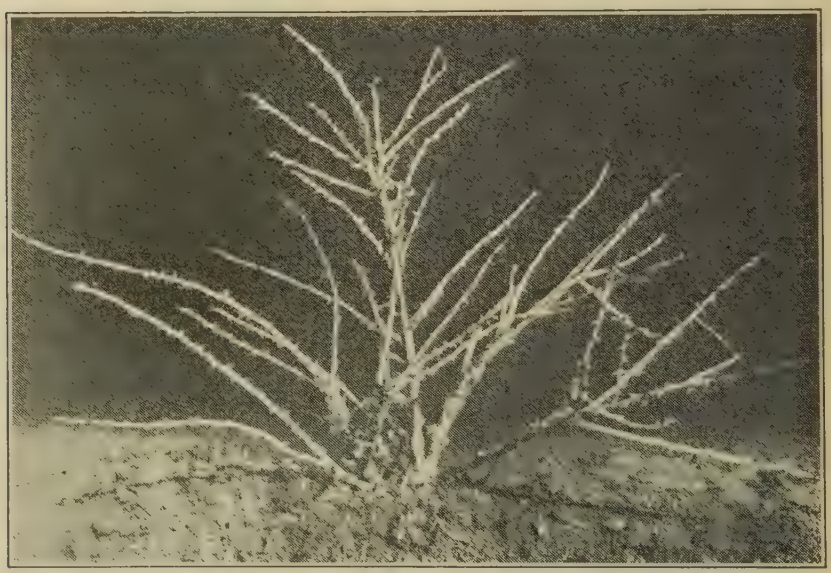

FIG. 13.—The gooseberry bush shown in Figure 12 after pruning. All branches lying on or close to the ground have been removed and those remaining have been thinned out.

governed by the same principles that apply to other crops. The kinds and quantities of the different plant foods that can profitably be used depend on the physical condition of the soil and the plant foods already available in it. The needs in any particular case can be determined only by applying the different plant foods separately and in various combinations to different parts of the plantation and noting the results. Thus, while stable manure and wood ashes can be used in liberal quantities and will generally prove profitable, each grower must determine for himself the amounts that will give the best results on his soil. In like manner the kind and quantities of commercial fertilizer to be used must be determined.

Where a supply is available, 10 to 20 tons of stable manure per acre each year may be profitable, and some successful growers use

even larger quantities. Many use hen manure. Larger quantities of this may be applied safely to gooseberry plantations than to currants.

In many sections green-manure or cover crops may be used to keep up the humus supply. The seed is sown or drilled in between the rows early enough to allow good growth before winter, and the crop is plowed under early the following spring. If this practice is followed, less stable manure or commercial fertilizer will be needed. The green-manure crops should be those best adapted to local conditions. Preferably, however, they should consist of legumes or a combination of legumes and nonleguminous plants.

PRUNING THE BUSHES.

Currants and gooseberries naturally form bushes with many branches which start out near the surface of the ground, as shown in

FIG. 14.—A 2-year-old gooseberry bush before pruning. See Figure 15. (Photographed October 22, 1915.)

Figure 10. Too many branches are usually formed. Pruning in a new plantation consists in removing the superfluous ones. It is only rarely that the branches are headed back. The pruning should be done during the dormant period. If not done following the dropping of the leaves in autumn, it is frequently delayed until spring, shortly before growth starts.

PRUNING CURRANTS.

Red or white currant bushes, when 1 year old, should have the weaker shoots removed, leaving six to eight strong shoots, according to the vigor of the bush. At the end of the next year, four or five 2-year-old shoots and three or four 1-year-old shoots should be left, and at the end of the third year about three shoots each of 3-year-old, 2-year-old, and 1-year-old wood.

The red and white currants bear their fruit at the base of 1-year-old wood and on spurs on older wood. They bear best on spurs on 2-year-old and 3-year-old wood. Pruning bearing bushes after they are more than 3 years of age consequently consists in removing all branches more than 3 years old which have passed this heavy-bearing period, leaving just enough 1-year-old shoots to take their places. Pruning, therefore, in effect is a process of renewal.

In pruning varieties of spreading growth, the outer and lower shoots generally should be removed, as these branches are likely to droop to the ground and the fruit borne on them covered with dirt. Varieties having an erect habit of growth, on the other hand, should be thinned by the removal of the central shoots. Figures 10 and 11 show a currant bush before and after pruning, illustrating the method described.

FIG. 15.—The 2-year-old gooseberry bush shown in Figure 14, after pruning. The branches lying on the ground were removed and the top thinned. (Photographed October 22, 1915.)

PRUNING GOOSEBERRIES.

The general principles of currant pruning apply also to gooseberries. The fruit is produced on 1-year-old wood and on 1-year-old spurs of older wood. Pruning consists in removing branches after they have borne fruit for two years and allowing new shoots to replace them. On the Pacific coast, however, the practice is to allow a branch to fruit for three years before removing it. It is said in that region that the canes are most productive the third year, after which they should be removed. If the side shoots become too numerous, enough of them should be cut out to form a fairly open head. Branches which have borne heavily tend to droop, and these, as well as all other drooping branches, should be removed.

Figures 12 and 13 show a 1-year-old gooseberry bush before and after pruning, while Figures 14 and 15 show an older gooseberry bush before and after pruning. This bush was so vigorous that more than nine branches were left.

Plantations of gooseberries trained to the tree form, where all the branches start from a main stem at a height of 1 or 2 feet above the

ground, have been comparatively unproductive in the United States. As the bush form, where all the branches start from the root at or just below the surface of the ground, is more productive, and as the gooseberry naturally grows in that form, it is the only one considered here.

Figure 16 shows a gooseberry plant grown in the tree form and Figure 17 one in bush form.

INJURIOUS INSECTS.[1]

THE SAN JOSE SCALE.[2]

The San Jose scale is sometimes destructive to currants and gooseberries. Infested plants become yellowish and unthrifty, many of the canes eventually dying. Plants seriously attacked will have a grayish appearance as if coated with ashes. Individual mature female scales are about the size of a pinhead, circular in outline, with a nipplelike prominence in the center (fig. 18).

FIG. 16.—A plant of the Jolly Angler gooseberry at Geneva, N. Y., trained to the tree form. This form is not as desirable as the bush form shown in Figure 17. (Photographed July 23, 1917.)

Thorough spraying of the infested plants each year, during the dormant period, with lime-sulphur concentrate, at the rate of 1 gallon to 7 or 8 gallons of water, will keep these insects under control, as well as the oyster-shell scale, also common on currants.

THE IMPORTED CURRANT WORM.[3]

The imported currant worm, when full grown, is about three-fourths of an inch long, green throughout, but yellowish at the ends. Young larvæ are covered with black spots, and the head is black (fig. 19). These worms attack both currants and gooseberries, ap-

[1] Prepared by A. L. Quaintance, entomologist in charge of deciduous-fruit insect investigations, Bureau of Entomology.
[2] *Aspidiotus perniciosus* Comstock.
[3] *Pteronus, ribesii* Scopoli.

pearing on the plants shortly after the leaves are out in the spring. They feed at first in colonies, but later scattering over the plants. Currant worms are voracious feeders and quickly strip the plants of foliage; hence, treatment should be given promptly upon their discovery. Another brood of larvæ appears in the early summer, and in some seasons there may be a partial third brood. These insects are destroyed readily with an arsenical (such as arsenate of lead paste at the rate of 2 pounds, or in powder form at 1 pound, to 50 gallons of water), sprayed or dusted over the plants. Effort should be made to destroy the first brood and prevent later injury. In treating the second brood when the fruit is ripening, powdered hellebore should be used, diluted 5 to 10 times with flour or air-slaked lime, or as a spray, 1 ounce to 1 gallon of water.

FIG. 17.—A plant of the May Duke gooseberry at Geneva, N. Y., trained to the bush form. The branches start at or below the surface of the ground. (Photographed July 23, 1917.)

THE CURRANT APHIS.[4]

The currant aphis curls the terminal leaves of the currant and gooseberry, especially the red currant, its presence resulting in little pits or pockets on the lower leaf surface (fig. 20). A reddish color usually develops on the upper surface of injured leaves, which can be seen some distance away. This aphis is easily controlled by spraying the plants as the leaf buds are opening in the spring, thus destroying the young stem mothers. The 40 per cent nicotine sulphate at the rate of 1 part to 800 or 1,000 parts of soapy water should be used, or kerosene emulsion or fishoil-soap wash may be used instead. Where the nicotine is used in small quantities, 1 teaspoonful to a gallon of

[4] *Myzus ribis* Linn.

water, or 1 ounce to 8 gallons makes the right proportions. In spraying later in the season the liquid should be directed against the insects on the lower surface of the leaves.

THE IMPORTED CURRANT BORER.[5]

The larvæ of the imported currant borer attack the canes, principally of the currant, eating out the pith, the hollows or burrows often being several inches in length. The injured canes put out a sickly growth in the spring, owing to their weakened condition, and may break from the action of the wind.

The parent insect is a handsome clear-winged moth, with a wing expanse of about three-fourths of an inch. These insects are out during June and deposit their brownish round eggs singly on the

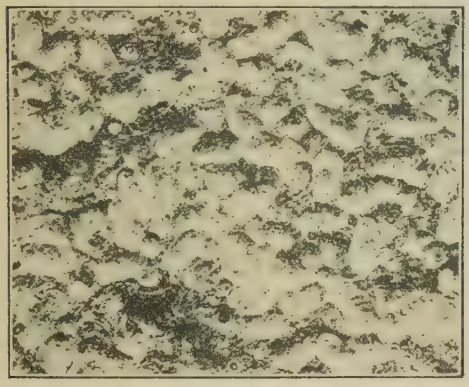

FIG. 18.—The San Jose scale. (Much enlarged.)

FIG. 19.—The imported currant worm and its injury to currant leaves.

plants. The resulting larvæ bore into the canes, tunneling up and down as they grow, becoming nearly full grown by fall, when they are about half an inch long, whitish in color, the head and legs brown. The larvæ hibernate in their burrows, complete their growth the following spring, and then pupate. In May or early June the moths emerge, completing the life cycle of the insect.

This pest is best controlled by cutting out and destroying in the spring the sickly and weakened canes. If this work is carefully done each year, it will aid much in keeping the insects reduced below injurious numbers.

THE YELLOW CURRANT FLY.[6]

The maggot of this small, pale yellowish fly infects the fruit of both the currant and gooseberry, causing it to color prematurely and usually fall to the ground. Infested berries generally show a discolored spot at the place punctured by the female in depositing the egg or marking the location of injured seeds. This insect occurs

[5] *Sesia tipuliformis* Clerck.

[6] *Epochra canadensis* Loew.

over the northern United States and Canada, but is more troublesome in the West, where in some regions it is practically a chronic pest. The maggots require about three weeks to complete their growth. Then they leave the berries, either while these are hanging on the plants or after they have fallen to the ground, change to the pupal stage at or below the ground surface, and remain in this condition until the spring following, when the adults appear and deposit eggs in the developing fruit.

No practical method of controlling this pest is known. Benefit, of course, according to the thoroughness with which the work is done, will follow the careful removal from the bushes and destruction of the prematurely ripening fruit.

FIG. 20.—Currant leaves curled by the currant aphis.

DISEASES.[7]

The fungous diseases of the currant and gooseberry are much the same and are rather generally distributed throughout the areas where these plants are grown. Descriptions of the most important diseases follow.

CURRANT DISEASES.

Cane wilt.—The fungus [8] causing cane wilt usually enters the plant through a terminal or lateral bud or a small branch on a cane and soon reaches the main stem, completely cutting off the water supply of the upper part and causing the leaves and fruit to wilt and die. The death of the cane may occur at any time during the growing season, but is most frequent and conspicuous about the time the fruit is ripening. This disease at present appears to be confined chiefly to New York and New Jersey. No noticeable difference in the susceptibility of different varieties has been observed.

Treatment.—The attempts to prevent or control this disease have thus far not been very successful. A combination of eradication and spraying is the best treatment that can be recommended. As a sanitary measure, all diseased canes should be cut out and burned as soon as discovered, and in the fall all canes dead and dying from any cause should be removed and burned. In addition to this, the spray treatment with Bordeaux mixture given under "Spray schedule" for anthracnose and leaf-spot should help to prevent new infections. The dormant spray with lime-sulphur for scale insects should also be helpful.

Anthracnose.—Anthracnose is caused by a parasitic fungus [9] which at first produces numerous small brownish spots thickly scattered over the upper surface of the leaves. As the disease progresses, the leaves turn yellow and drop. In severe cases the bushes may be

[7] Prepared by C. L. Shear, Pathologist, Office of Fruit-Disease Investigations, Bureau of Plant Industry.

[8] *Botryosphaeria ribis* Gross. and Dug.

[9] *Pseudopeziza ribis* (Lib.) Kleb.

defoliated before the fruit has ripened. Sometimes also the fruit-stalk and fruits are attacked by the fungus. In less severe cases the foliage may not fall until after the fruit has matured. The canes, however, do not mature properly in either case and are much weakened and more liable to winter injury and fungous diseases than normal vigorous canes. Some varieties are more subject to attack by this disease than others. The Albert (*Prince Albert*) and the Wilder varieties are said to be usually free from attack, while the Fay and the Victoria are likely to be badly affected.

Treatment.—The dormant spray with commercial lime-sulphur, 1 to 10, as commonly used for scale insects, is very helpful in controlling anthracnose. During the growing season the plants should be sprayed with Bordeaux mixture according to the spray schedule given on page 24. In severe cases it may be necessary to spray after the fruit has been picked, in order to prevent premature defoliation. Spraying just before the fruit is ripe may result in staining and necessitate washing.

Leaf-spot.—Leaf-spot [10] is characterized by the appearance of irregular spots, having a pale center and brownish purple margins. Minute brownish black pustules of the fungus are produced on the under sides of the spots on the leaf. These pustules are the fruiting bodies of the parasite. The spots may become so numerous on the leaves that the plants are more or less defoliated. This trouble is not often as serious as in the case of anthracnose, and the leaves do not usually fall until late in the season. Where there is defoliation, however, there is injury to the plant and a decrease in its productivity.

Treatment.—The treatment for leaf-spot is the same as that for anthracnose, as given in the spray schedule on page 24.

Angular leaf-spot.—Angular leaf-spot [11] is usually less frequent and less serious than the other leaf troubles. The spots produced by the fungus are scattered, roundish, or angular, and ashy or whitish.

Treatment.—The spray treatment recommended for anthracnose will also prevent angular leaf-spot. (See spray schedule.)

Powdery mildew.—Besides the above diseases, powdery mildew of the gooseberry sometimes occurs on the currant, but it is rarely of sufficient importance to require treatment.

GOOSEBERRY DISEASES.

Powdery mildew.—Powdery mildew [12] is not usually severe on American varieties of the gooseberry. It is most serious on European varieties or hybrids with European varieties. The fungus first appears in the form of a white, more or less powdery growth on the young leaves and shoots as well as fruit. As it develops further it forms a thin, felty, reddish brown coating of fungous filaments on the fruit, foliage, and stems.

Treatment.—The most satisfactory treatment for powdery mildew is commercial lime-sulphur, 1½ gallons to 50 gallons of water. Three or four applications should be made, beginning as soon as the leaf buds begin to open, and repeating at intervals of 10 to 14 days. Where the attack is severe, the diseased tips of the canes should be cut out and burned, as the fungus lives over winter in these diseased parts.

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[10] *Septoria ribis* Desm.
[11] *Cercospora angulata* Wint.
[12] *Sphaerotheca mors-uvae* (Schw.) B. and C.

Anthracnose.—Anthracnose [13] of the gooseberry is caused by the same fungus and has the same general appearance as anthracnose of the currant. It is, however, usually less serious on the gooseberry.

Treatment.—Spraying with Bordeaux mixture, in accordance with the directions in the spray schedule for currant anthracnose, will control this disease.

Leaf-spot.—Leaf-spot [14] has practically the same appearance on the gooseberry as on the currant and is caused by the same fungus. It sometimes causes the plant to lose its leaves.

Treatment.—It can be controlled by giving the treatment directed in the spray schedule for currant leaf-spot.

WHITE-PINE BLISTER RUST.

White-pine blister rust is a destructive disease of white pines, brought into the United States during the years 1898 to 1910, on white-pine planting stock imported from Europe.

It is now well established in the New England States and New York and is spreading in Pennsylvania, New Jersey, Michigan, Wisconsin, Minnesota, and Washington. It is also in the Canadian Provinces of Quebec, Ontario, and British Columbia.

Currants and gooseberries, both wild and cultivated, are the chief agencies in the spread of this disease. For this reason, the currant and gooseberry industry must be considered in connection with the preservation of the white-pine timber supply.

White pine is one of the most valuable timber trees of the United States. It grows rapidly, produces a high yield of lumber of excellent quality, and is found over vast areas, in both the eastern and the western parts of the country. The standing white pine in the United States is valued at not less than $500,000,000 and that in Canada at $600,000,000.

The term "white pine" includes all of the five-needle pines, the most important of which are the eastern white pine, western white pine, and sugar pine.[15] The wood of these species has first choice for a great variety of uses and has been important in the agricultural and industrial development of the United States. The white pines are favorite ornamental trees and are widely used for shade and shelter-belt purposes in regions where they are not primarily important for timber. For such uses these trees often possess a value which in some respects is far greater than their timber value, but in general their greatest value lies in their capacity to produce highly profitable timber crops under forest management. The practice of forestry in the United States will be very seriously handicapped if blister rust is not controlled.

White-pine blister rust can not be eradicated from North America, but its spread can be delayed, and local control applied, to the extent to which the public cooperates in combating the disease. The growers

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[13] *Pseudopeziza ribis* (Lib.) Kleb.

[14] *Septoria ribis* Desm.

[15] The white pines native to North America are: (1) White pine (*Pinus strobus*); (2) western white or silver pine (*P. monticola*); (3) sugar pine (*P. lambertiana*); (4) limber pine (*P. flexilis*); (5) white-bark pine (*P. albicaulis*); (6) bristle-cone pine (*P. aristata*); (7) foxtail pine (*P. balfouriana*); (8) Mexican white pine (*P. strobiformis*); (9) Ayacahuite pine (*P. ayacahuite, veitchii, bonapartea, loudoniana*).

of currants and gooseberries should know the main facts regarding this disease so they can cooperate intelligently with State and Federal Governments in combating it.[16]

WHAT CAUSES BLISTER RUST AND HOW IT SPREADS.

The blister rust is caused by a parasitic fungus which grows on the leaves of currants and gooseberries and then attacks and kills white (five-needle) pines. In order to attack a pine tree, it must first undergo an intermediate development on the foliage of the currant or gooseberry. It can not pass directly from a diseased pine tree to a healthy one. A diseased pine tree can infect no other plants with the rust except currants and gooseberries.

The regions where currants and gooseberries thrive best are also the regions most favorable for the white pines and have climatic conditions well suited to the rapid development of the blister rust. The disease is highly destructive to white pines wherever currants and gooseberries are grown.

BLISTER RUST ON WHITE PINES.

The blister rust first attacks the needles and young twigs of a pine tree. It grows in the inner bark and kills by girdling. Trees of every size are destroyed, sometimes by direct infection of every twig and branch on the tree, but usually the fungus gradually grows back from a single infected twig into the trunk and girdles it. The rust lives and grows in the pine bark from year to year until the tree dies.

Early in the spring of the third or fourth year after a pine tree is attacked by the rust, orange-colored blisters burst through the diseased bark and continue to do so each spring as long as the diseased tree remains alive. These blisters are about the size of a navy bean and contain immense numbers of dustlike spores so small and light in weight that they can be carried many miles—in some cases hundreds of miles—by the wind. These spores of the blister rust correspond to the seeds of other plants. They may retain their power of germination for several months, but the only "soil" in which they can grow is the foliage of currant and gooseberry bushes.

This fact is important and it is repeated for the sake of emphasis that the blister-rust spores produced on white-pine trees can not infect other pines or any other plants except currants and gooseberries.

BLISTER RUST ON CURRANTS AND GOOSEBERRIES.

When the spores from a diseased pine fall on either a currant or gooseberry leaf, they may germinate, or sprout, grow into the leaf tissue, and produce a rust. This is the currant rust, or the summer stage of the blister-rust fungus. It appears as tiny orange-colored pustules on the under side of the infected leaf. These pustules are filled with spores which can infect all kinds of currant and gooseberry bushes, but no other plants. The rust spreads from bush to bush through successive generations of the summer stage, new generations coming on at intervals of 10 to 14 days from early June

[16] For a complete discussion of the origin and nature of white-pine blister rust, see Investigations of the white-pine blister rust. U. S. Dept. Agr. Bul. 957, 100 p., 13 fig, 6 pl. 1922. Literature cited, p. 80–100.

until the leaves fall in the autumn. Each succeeding generation intensifies the rust locally on currants and gooseberries, and by repeated jumps the disease may reach currant and gooseberry bushes at a considerable distance from bushes infected earlier. The spores of the summer stage are somewhat sticky and readily carried by insects, birds, and animals, as well as by the wind. Since the spores of this stage may retain their infecting power for a week to several months, the possibility of the long-distance spread of the rust during the course of a season is evident.

The cultivated black currant [17] is the favorite host of the blister rust. Compared to it, other species of currants and gooseberries are relatively resistant to infection, but after it is infected the rust spreads to other currants and gooseberries. The cultivated black currant has many characteristics which favor infection. It is a plant of exceptionally vigorous growth, has large leaves and luxuriant foliage, and produces new shoots and leaves to a maximum late in the season; that is, it has a large leaf surface on which spores of the rust may be produced in large numbers. It is a tall bush, grows in the open, and is an excellent target for the reception of wind-blown spores. A diseased cultivated black-currant plant usually produces three or four times as many of the spores which infect white pines as are known to be produced by any other currant or gooseberry, and hundreds of times as many as are produced by most varieties.

TRANSFER OF BLISTER RUST FROM CURRANTS AND GOOSEBERRIES BACK TO THE PINE.

The summer stage of the rust on currants or gooseberries is harmless to white-pine trees, but from late June to the end of the growing season the rust develops another stage on currant or gooseberry leaves which enables the disease to pass back to the pine. In this last stage, as in the preceding stages, the rust forms spores which are readily transported by the wind. However, these pine-infecting spores retain their power to germinate for only a very brief period after being blown from the currant leaf, instead of remaining alive for weeks or months, as is the case with the spores in the other stages. The spores that transmit the rust to pine are so delicate and short lived that infected currant or gooseberry bushes, with the exception of cultivated black currants, have not been found to cause damage to pines beyond a distance of 900 feet from where they are located. This must not be confused with the spread from pine to currant, which is many miles.

CONTROL MEASURES TO PROTECT PINES.

The white-pine blister rust can be controlled because there are two weak points in its life cycle.

It can not spread to the pines without first growing on currant and gooseberry plants, and these produce pine-infecting spores of very short life.

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[17] *Ribes nigrum* L. (the European black currant).

To protect white pines from damage by the rust, it is only necessary to destroy the currant and gooseberry bushes within a short radius of the pines. The exact distance varies with local conditions, but ordinarily 900 feet is a safe distance to separate pines from currants and gooseberries—if cultivated black currants are absent. In the Eastern States pines standing more than 900 feet from currant and gooseberry bushes infected with blister rust have not suffered commercial damage from the disease except when the rust spread from cultivated black currants. Wild currant and gooseberry bushes are commonly found growing with the pines. Local control of the blister rust is accomplished by pulling up all wild and cultivated currant and gooseberry bushes within 900 feet of the pines to be protected. In addition to this, cultivated black currants generally must be eradicated. Local control can be applied by individual landowners, but is most effective on a community basis.

CONTROL MEASURES TO PROTECT THE CURRANTS AND GOOSEBERRIES.

In regions that are infected, there is no practicable method by which the grower can protect currants and gooseberries from the rust. Many experiments with spraying have been tried, but none has been successful in preventing infection or in killing the blister-rust fungus after it attacks the currant or gooseberry.

Destruction of the entire plantation is the only effective control measure after the rust attacks currants or gooseberries. To destroy only the infected individual bushes is impracticable, because the rust spreads from one bush to another, and it is impossible to find every infected bush in time to prevent its spread to other bushes. Cultivated bushes are not known to be killed by the blister rust, but those which are heavily infected lose their leaves in midseason, and the crop is seriously reduced. No species or variety of currant or gooseberry appears to be immune to the rust, but the different kinds vary greatly in degree of susceptibility to it.

The greatest protection to currant and gooseberry growers, as well as pine owners, is afforded by the general destruction of cultivated black-currant [18] plants throughout the country.

The blister rust was introduced into the United States in recent years and has not yet spread into many States and localities. It is important to keep the disease out of disease-free regions as long as possible and to delay its progress in regions where it has begun its ravages. To accomplish this, the destruction of cultivated black currants in all States where white pines occur is an exceedingly important general control measure.

WHY CULTIVATED BLACK CURRANTS SHOULD BE DESTROYED.

The common cultivated black currant is the nurse plant of the blister rust. This plant, in the vast majority of cases, has been the outpost in the spread of white-pine blister rust; that is, it has been the first to become infected with the disease and at points farthest from infected pines.

In the Northwest, cultivated black currants have become infected with the rust at distances up to 150 miles or more from the nearest

[18] *Ribes nigrum* L. (the European black currant).

infected pines. In such cases the cultivated black currant has been the principal medium through which the disease has traveled from infected pines to healthy pines in widely separated regions.

These bushes, because of their extreme susceptibility to the rust, become diseased at great distances from infected pines, and then rapidly infect the more resistant species of currants and gooseberries growing near them. Black currants thus establish centers from which the rust continues its spread by repeated jumps on all kinds of currant and gooseberry plants, infecting large numbers of bushes over a considerable extent of territory.

White pines are popular ornamental trees and are extensively planted outside of commercial pine-growing regions. For this reason white-pine trees are frequently located near gardens in which currants and gooseberries are growing and they become infected with blister rust as a result of the general spread of the disease on the

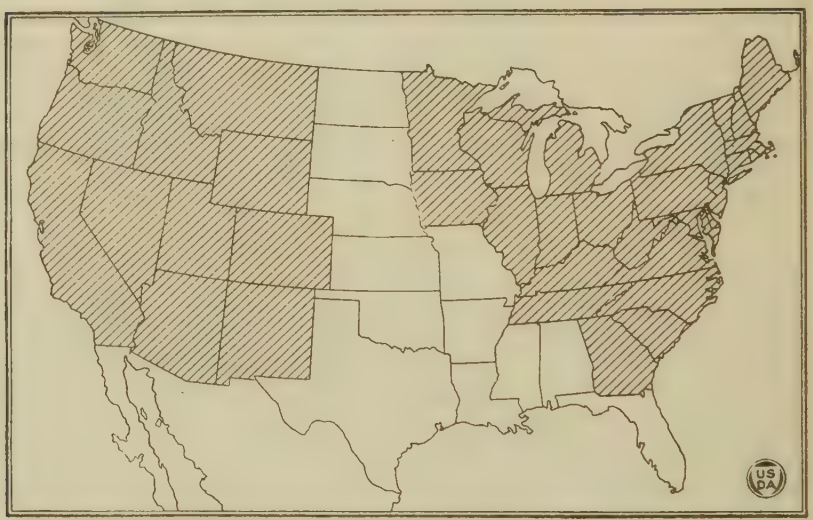

FIG. 21.—Outline map of the United States, showing by diagonal lines the regions where the cultivated black currant (*Ribes nigrum*) should not be grown.

currant and gooseberry bushes of the section. A new center of pine infection is thereby established, from which the disease spreads again to distant cultivated black currants.

Field conditions have uniformly shown that if there had been no cultivated black-currant bushes the white-pine blister rust would not be so widely established in America as it is to-day.

In order to have white pines it is necessary to sacrifice cultivated black currants. The cultivated black currant is of no great commercial value in this country. While it may be successfully grown on a small scale in some regions, the market demands for this fruit are limited, and, in general, it is less profitable to grow than the red currant. That it is prized in individual cases is, of course, fully understood.

The United States Department of Agriculture recognizes the cultivated black currant as a distinct menace to the white-pine timber supply of the country. It is a menace not only to the thousands of

farm owners who grow white pines in their wood lots or in their shelter belts and dooryards, but also to all citizens, since all use white-pine lumber, directly or indirectly. The cultivated black currant so seriously threatens the production of white-pine timber as to make it a public nuisance in all States where white—five-needle—pines grow. The Department of Agriculture is opposed to the growing of this currant [19] anywhere in the United States, and recommends that State authorities, nurserymen, and growers take active steps to eliminate it from the Pacific, Rocky Mountain, Atlantic, Appalachian, Ohio Valley, upper Mississippi Valley, and Lake States. (Fig. 21.)

Growing cultivated black currants, in home gardens as well as in nurseries and commercial plantings, should be entirely abandoned throughout these States because of the great importance of the native and planted white pines and the relatively small economic value of the cultivated black currant. There are some individuals to whom the loss of cultivated black currants will mean a measurable sacrifice. But the menace of the blister rust to our white-pine forests demands this sacrifice in the regions named, since in no other way can the spread of the rust be checked.

CONSULT THE STATE NURSERY INSPECTOR BEFORE PLANTING CURRANTS AND GOOSEBERRIES.

The invasion of North America by the white-pine blister rust has brought about in many States certain laws and quarantines regulating the shipment, planting, or possession of currants and gooseberries. A summary of these laws and quarantines is appended (p. 33), but changes are constantly being made, owing to changes in the blister-rust situation.

The prospective planter should not purchase black-currant plants, and before investing in stock of other kinds of currants and gooseberries should communicate with the nursery inspector in his State regarding the requirements. A number of States have enacted laws authorizing State officials to compel the destruction of currants and gooseberries in certain districts or in the entire State and to prohibit the planting of currants and gooseberries in control districts.

HELP TO SAVE OUR WHITE-PINE FORESTS.

The white pines are a great national asset, essential to forestry development in this country. In view of the value of our white-pine forests and the loss in wealth and in productive power of our forest lands which will result if blister rust is not controlled, it is the duty of every citizen to aid in saving the pines.

The blister rust presents a national problem, which can be solved only by the hearty cooperation of growers of currants and gooseberries.

SPRAY SCHEDULE FOR INSECTS AND DISEASES.

DORMANT TREATMENT.

Just as the buds begin to swell, spray with lime-sulphur concentrate at the rate of 1 gallon to 7 or 8 gallons of water. This is for

[19] *Ribes nigrum* L. (the European black currant).

the control of the San Jose and other scales and is of some value in preventing fungous diseases.

FOLIAGE TREATMENT.

First application.—Just as the leaves are unfolding in the spring, spray with Bordeaux mixture, 4–4–50.[20] This treatment is for cane wilt, anthracnose, and leaf-spot.

Second application.—Ten to twelve days after the first treatment spray with Bordeaux mixture, 4–4–50, plus 2 pounds of arsenate of lead paste (or 1 pound of arsenate of lead powder) to 50 gallons of spray. This is for the control of the fungous diseases mentioned and also for the imported currant worm.

Third application.—Twelve days to two weeks after the second treatment, spray with Bordeaux mixture, 4–4–50, plus 2 pounds of arsenate of lead paste (or 1 pound of arsenate of lead powder) to 50 gallons of spray. This is for the control of the troubles mentioned under the second application. In gardens it will be safer to use hellebore than arsenate of lead to control the imported currant worm, especially at the time of this application. (See p. 14 for directions.)

Note.—In cases where the powdery mildew is serious, dilute lime-sulphur concentrate at the rate of 1½ gallons to 50 gallons of water should be used instead of Bordeaux mixture, as previously stated.

DURATION OF A PLANTATION.

If a currant or gooseberry plantation is properly cared for, at least 8 to 10 crops may be expected before it becomes unprofitable because of its age. Productive fields over 20 years old are not uncommon in some sections. Although the number of years a plantation will continue in good bearing condition depends to some extent upon location and soil, the most important factor is the care which it receives. The period of productiveness of both currant and gooseberry plants is longer in northern regions than toward the southern limits of their culture, and longer on heavy soil than on sandy soil.

HARVESTING THE CROP.

Currants and gooseberries may be left on the bushes for a long time after they are ready for use, from four to six weeks in the case of gooseberries, and with some varieties of currants even longer. For fruit which is to be marketed, however, the picking season is shorter, its length depending upon the variety.

Fruit which is intended for the general market should be picked and handled with great care. Injury to the skin furnishes an opportunity for the development of molds and bacteria which cause the fruit to spoil very quickly. There is also in the case of currants a leakage of the juice, which makes them unattractive and causes dust and dirt to adhere to them.

Quart baskets are often used as containers in picking. They may be set in hand carriers or in waist carriers attached to the belt or suspended from the shoulders of the picker.

[20] Copper sulphate (bluestone), 4 pounds; stone lime, 4 pounds; water to make 50 gallons of spray.

Currants should be picked by separating the stem of the cluster from the branches with the fingers and not by grasping the clusters of berries and pulling them off. The berries are easily crushed and should never be pressed in picking. Certain varieties develop no berries at the base of the fruit cluster, next to the branch or spur, and these can be picked easily without danger of crushing. This is an especially desirable characteristic in a variety grown for market purposes.

When currants are to be used for jelly, they should be slightly underripe, as in that stage of maturity the berries contain more pectin (the substance in the juice of fruit which enables it to form jelly) than when thoroughly ripe. This is especially necessary with the Perfection, Red Cross, and other sorts which become rather

FIG. 22.—A fanning mill through which gooseberries are being passed, as they are received from the pickers, for the purpose of removing the leaves that are mixed with them in picking. (Photographed June 16, 1915, at Rancocas, N. J.)

mild flavored when fully ripe. If the fruit is to be spiced, stewed, or used for jam, it should be fully ripe when picked.

In this country, gooseberries are usually picked before they are fully ripe. As soon as they are fully grown, which, in general, is about the time red raspberries begin to ripen, they may be picked for the canning factory or for jelly or jam making. When to be used for these purposes, they may be stripped by hand, or a scoop resembling a cranberry scoop may be employed in picking. Gloves are worn when stripping the berries from the branches. In stripping, the berries are mixed with leaves, which are cheaply removed by passing through a grain-fanning mill, as shown in Figure 22.

When gooseberries are intended for the general market they should not be stripped from the branches, as the sharp thorns cut many of the berries and these quickly spoil. Large-fruited sorts must be handled with special care in order to avoid injuries. When fancy prices are obtained for these large sorts, the bushes are sometimes

picked over twice. After the full-grown berries are removed at the first picking, the small ones increase rapidly in size and are ready for picking in a few days. They are usually marketed in quart baskets; more rarely in pint baskets.

In Europe large quantities of ripe gooseberries are eaten out of hand. Venders and fruit stores sell them in paper sacks and other containers, as cherries are sold in this country. In the United States, however, gooseberries are not commonly eaten without cooking, although many sorts are delicious when ripe and rank among the best dessert fruits. In fact, in this country gooseberries are used almost entirely in the green state. As gooseberries are of different colors when ripe, and vary in their season of maturity, it will be necessary to learn by experience the proper time to pick each sort.

FIG. 23.—A 32-quart crate of Perfection currants ready for market. Note the relatively large size and long stems of this sort. (Photographed July 20, 1915, at Westwood, Mass.)

Gooseberries sun scald very quickly after picking and should be kept in the shade. Berries left in bright sunshine for half an hour, or even less, are likely to sun scald badly.

Figures 23 and 24 show crates of currants and gooseberries ready for market.

YIELDS OF FRUIT.

The currant, as a rule, bears abundant annual crops. Good plantations of gooseberries of European parentage should yield at least 100 bushels per acre. Those of American or partly American parentage are generally more productive, and yields of 300 bushels and more per acre are not unknown. European varieties, however, usually sell for much higher prices than American varieties.

Bushes in gardens usually receive more intensive cultivation than those in large plantations and therefore yield more as a rule. Cur-

rant bushes under garden conditions often yield from 5 to 10 quarts each, and gooseberries even more.

VARIETIES.

CURRANTS.

For commercial plantations vigorous, erect-growing, productive varieties should be chosen. The more acid varieties should be selected for jelly making and the milder varieties for dessert uses. The fruit should be large and firm and borne in compact clusters. Deep-red varieties are preferred for the market. For dessert use in the home the white currants are considered best.

The following varieties are suggested for the sections named: Perfection, Wilder, Red Cross, and White Imperial for the northeastern

FIG. 24.—A 32-quart crate of Columbus gooseberries at Middle Hope, N. Y. Note the large size of this variety, which is one of the most desirable of the European sorts. (Photographed June 23, 1915.)

part of the United States; London Market, Wilder, Red Cross, and Perfection for Michigan and other parts of the Middle West; Perfection, London Market, Red Cross, Wilder, Fay, and Victoria for the Pacific coast.

In certain localities in the regions specified, other varieties may be better adapted. The Fay, Perfection, Cherry, White Grape, Red Cross, and London Market have been found entirely hardy in North Dakota and should be hardy anywhere in the United States.

Most growers prefer to plant but one or two varieties. If two varieties are used, an early and a late one are selected.

Figure 25 shows the character of the fruit of several varieties of currants, while Figure 26 shows a branch with the characteristic short clusters of the black currants.

RED VARIETIES.[21]

Albert (*Prince Albert, Rivers Late Red*).—Berries medium to large, hang on the bushes well, season very late; clusters of good size. Bush large, upright, stiff. Foliage abundant, dark green, resistant to disease, and remaining on the bushes until late. Productive and promising as an extra-late variety.

Cherry.—Berries large, becoming smaller as the bush grows older; deep red, very acid, midseason. Bush somewhat spreading. The genuine Cherry is unproductive.

Diploma.—Berries very large, bright glossy red, mild subacid; clusters easily picked. Bush upright, slightly spreading; canes rather brittle. Unexcelled for home use on account of its beauty and quality.

Fay.—Berries large, dark red, acid, early to midseason; clusters with small berries at the ends, easy to pick. Bush very spreading, canes easily broken; needs fertile soil. One of the leading varieties in New York.

Filler.—Berries large, bush upright; similar to the Fay, but preferred to that variety in the Hudson River valley.

London Market (*London Red*).—Berries medium to large, deep red, rather acid, midseason to late; clusters compact, with short stems. Bush upright, somewhat resistant to borers and diseases; reported as the most resistant of any variety to the white-pine blister rust. The best variety in many sections of the Middle West.

Long Bunch Holland (*Franco German*).—Berries medium size, light red, acid, season very late; clusters long. Bush upright, vigorous; only moderately productive. Desirable for dry western climates.

FIG. 25.—Boxes of several varieties of currants, with clusters of each variety in the foreground. The varieties represented are (from left to right) the Lee (black), Albert (red), Champion (black), Margeson (white), and Perfection (red). (Photographed July 20, 1915, at Westwood, Mass.)

Perfection.—Berries large, bright crimson, sprightly subacid, midseason; clusters compact, very long, easy to pick. A heavy yielder. Berries sometimes scald in hot weather if not picked as soon as ripe. Bush more or less spreading, throwing up few canes from below the ground; canes break easily. A very promising variety for all sections and the best variety in parts of the Northwest.

Pomona.—Berries medium to large, light red, subacid, midseason to late; clusters long. Bush fairly vigorous, spreading; canes rather brittle. Very productive.

Red Cross.—Berries large, firm, light red, subacid, hang on bushes well; midseason, but later than Cherry; clusters of medium length, well filled, easy to pick. A desirable variety in most sections, although cracking so badly at one point in the Hudson River valley that it has been discarded. Not so good for jelly as others.

Victoria (*Ruby Castle*).—Berries medium size, bright red, mild subacid, hang well on bushes; clusters long, loose. Bush upright, large, very free from diseases and most insects, but susceptible to hot-weather injury in some sections. Very productive and very hardy. The Victoria, London Market, and Albert are valuable in prolonging the season.

Wilder.—Berries large, dark red, mild subacid, hang on bushes well, midseason; clusters large, compact, easy to pick. Bush upright and large. A

[21] The characterizations of red and white varieties of currants have been prepared in cooperation with Paul Thayer, formerly Assistant Horticulturist at the Ohio Experiment Station, now at Pennsylvania State College.

desirable variety and hardy in all regions except the upper Mississippi Valley region. The leading variety in the Hudson River valley and Lake Erie fruit belt.

WHITE VARIETIES.

White Grape.—Berries large, pale yellow, very mild flavor; clusters long, well filled. Bush very productive.

White Imperial.—Berries large, pale yellow, almost sweet; clusters medium length, loose. Bush spreading, very productive. A desirable variety; considered to have the best dessert quality of all currants.

NATIVE AMERICAN VARIETIES.

Crandall.—Berries large, bluish black, with a characteristic flavor somewhat unlike other black sorts; clusters rather small. Bush spreading; succeeds in regions having hot summers. The Golden Prolific is a variety similar to the Crandall, but with golden fruit. The berries of both these sorts must be picked singly, as they do not all ripen at the same time. Though the fruit is bluish black, it should not be confused with the commonly cultivated black

FIG. 26.—A branch of the Golden Prolific currant. This is a variety of the species *Ribes odoratum*, which is native to western Kansas and Oklahoma, eastern Colorado, and surrounding regions. Varieties of this species are very productive under some conditions, but under other conditions are unproductive. (Photographed June 30, 1917.)

currants of European origin, such as Naples, Lee, and Boskoop, which are prohibited by quarantine from most of the United States. These are horticultural varieties of *Ribes nigrum*, while Crandall is a variety of the native species, *Ribes odoratum*.

GOOSEBERRIES.

As already stated, the American varieties of gooseberries are usually the most productive. They are hardier and are considered by most Americans to be of better quality. The European varieties are larger and sell much better in the market, but are rather subject to mildew, though this disease is not generally as serious as commonly supposed. Because of the much higher prices usually paid for the European varieties, they will be more profitable in many cases, unless the Poorman, a new native variety of large size, proves widely adapted.

Figure 27 shows fruits of the Columbus, Industry, May Duke, Poorman, Downing, and Carrie varieties.

AMERICAN VARIETIES.

Carrie.—Fruit small to medium, too small to be promising, red when ripe. Bush quite free from mildew, with few short thorns; very productive. Grown chiefly in Minnesota, Wisconsin, and neighboring States, where it is of value. In the Eastern States it greatly resembles the Houghton, but it is not recommended to replace that variety.

Downing.—Fruit large for an American sort, pale green. Bush rarely attacked by mildew; very productive. The most widely grown variety in the United States and liked better than other varieties for canning. Notably resistant to the aphis.

Houghton.—Fruit small, dark red. Bush more susceptible to mildew than the Downing, branches somewhat drooping; very productive. One of the most widely grown and productive varieties in the United States, but too small and not liked as well for canning as the Downing. Very susceptible to the aphis.

Josselyn (*Red Jacket*).—Fruit large for an American sort, reddish green. Bush productive, mildews in some localities; a promising variety in some localities in the Northeastern States.

Oregon (*Oregon Champion*).—Fruit large for an American sort, color green. season late. Bush very productive; rarely attacked by mildew. The best

FIG. 27.—Gooseberries of different varieties, showing the relative sizes of the fruits. From left to right the individual fruits represent the Columbus, Industry, and May Duke (European sorts), and the Poorman, Downing, and Carrie (American sorts).

variety in the northwestern Rocky Mountain and Pacific Coast States and promising for all parts of the United States.

Poorman.—Fruit the largest of the American varieties, brilliant red when mature. Bush very vigorous, productive; thorns shorter and fewer and less objectionable than those of other varieties. In New York and Utah it is considered the best of all varieties. Promising for all parts of the United States.

EUROPEAN VARIETIES.

Chautauqua, Columbus, Portage, and Triumph.—These varieties are all very similar, even if not identical. Fruit very large, pale green. Bush in open localities does not mildew seriously; somewhat spreading, productive. Replacing American varieties to some extent because of their larger fruit; generally liked better than the Industry variety.

Industry.—Fruit very large, dark red, somewhat hairy. Bush upright, productive. Bush and fruit subject to mildew. Nursery stock of this variety should be in the bush rather than the tree form.

May Duke.—Fruit large, dark red; season early. Bush spreading, productive. This variety is recommended by the New York Agricultural Experiment Station as the best early gooseberry of European parentage.

WAYS OF USING THE FRUIT.

Currants and gooseberries are used chiefly in making jams, jellies, preserves, pies, tarts, etc., rather than in the fresh state, like most

other fruits. Both fruits contain a large quantity of pectin, which is necessary for jelly making. The currant is commonly considered the best of all fruits for making jelly, but comparatively few know that gooseberry jelly is very nearly, if not quite, as good as currant jelly and may be made much more cheaply. Furthermore, gooseberries are a general favorite for jam, and jams made from gooseberries and raspberries combined or from gooseberries, raspberries, and currants combined are better even than jam made from gooseberries alone. In fact, both the currant and the gooseberry may be used in many different ways and are especially valuable for combining with other fruits. Directions for the utilization of the fruit are given in the following pages. The following points should be especially noted:

(1) The seeds of the red and the white currants become very noticeable upon cooking and should be removed when making jams, preserves, etc. Blackcurrant seeds and gooseberry seeds usually do not become objectionable when cooked and may be left in.

(2) If cooked slowly, gooseberries which are green in color when ripe will make jam or jelly as highly colored as those which are red when fully ripe.

(3) The flavor, texture, and color of gooseberry jam and jelly made by long cooking are quite different from those made by rapid boiling. Part of the flavor of the fresh fruit is lost through long cooking; the color is deepened and the texture is slightly toughened. Some like the product made by cooking a few minutes much better than that made by cooking for an hour or more; others prefer the slowly cooked product.

(4) If a fruit-pulp machine similar to a food grinder is used, the skins and seeds of the currant may be readily separated from the pulp. This pulp can then be used for jam and the skins for making jelly. The jam resulting from the use of the pulp only is preferred by many to that containing both skins and pulp.

(5) The pulp from which the juice has been pressed for jelly may be reheated with water and pressed a second time. The resulting juice makes a very good grade of jelly. In many cases a third or even a fourth extraction of the juice may be made.

(6) In making jams and jellies the proportion of sugar to berries will vary according to individual taste and the character of the fruit. Jams of good flavor may be made by the use of 1 pound of sugar to 1 pound of unripe berries, or one-half to three-fourths of a pound of sugar to 1 pound of ripe berries. In making jelly, 1 pound of sugar to 1 pint of juice of unripe fruit or three-fourths of a pound of sugar to 1 pint of juice of ripe berries may be used.

(7) Black currants belong to two groups—the European and the American. Although varieties of both sorts have the peculiar aroma of black currants, the American black currant loses most of this characteristic flavor after cooking and makes a mild, delicately flavored product, while varieties derived from the European species make a strong-flavored jam or jelly. It is well to combine these different extractions before making them into jelly; otherwise, the later extractions may be somewhat lacking in flavor.

JELLIES.

Jelly of the best quality is easily made from either currants or gooseberries. Although currant jelly has been generally considered the better, some prefer that made from gooseberries. The finest colored product is made from one part of white currants to four parts of red currants.

For jelly, the currants and gooseberries should be picked before they are entirely ripe. The fruit should be washed, but need not be stemmed. After mashing, add a small quantity of water, heat almost, but not quite, to the boiling point, and hold there until the skins turn a lighter color; then strain through a jelly bag. Add three-fourths of a pound of sugar to each pint of juice and boil until

a small quantity, when poured from a spoon, flows in a sheet rather than in single drops. Pour into sterilized glasses and, when cool, seal with hot paraffin.

By following these simple directions, excellent jellies can be made. In making especially delicate jellies the following precautions should be observed: Remove the stems before cooking. Use only dry berries, and do not use those picked within two days after a rain. That juice is best which flows from the jelly bag without pressing, but the juice which is pressed out may be used for second-grade jelly. Boil the juice separately for 10 minutes and heat the sugar before combining the two. In order to get a deep-red gooseberry jelly, the juice should be boiled down slowly. To make pink gooseberry jelly, the juices should be boiled down quickly. Tart jellies may be made by using one-half pound of sugar to each pint of juice, and sweet jellies by using 1 pound of sugar to each pint of juice.

JAMS.

The seeds of red and of white currants are large and very objectionable, so that jams are rarely made from them unless the seeds are first extracted. Even then, the jam is not usually liked as well as gooseberry jam or such combinations as gooseberry-currant or raspberry-currant jams. For use with bread, crackers, etc., raspberry-currant jam is considered one of the most desirable, and then, in order of merit, gooseberry-currant, gooseberry, and currant jams.

For use with meats, gooseberry, gooseberry-currant, and gooseberry-blackberry combinations are all liked. Strawberries, raspberries, apples, cherries, etc., may also be combined with currants and gooseberries, and jams thus made will add a pleasing variety to the supply of preserves.

Black-currant jams have a peculiar flavor, and it is usually necessary for Americans to acquire a taste for them. Varieties of European parentage are considered better for making jam and jelly than those of American parentage, for the latter lose the distinctive black-currant flavor in cooking.

Gooseberry jam.—Wash "top and tail" (i. e., remove the stems and the remains of the blossoms), mash, and boil until soft. Add a little water and one-half to three-fourths of a pound of sugar to a pint of gooseberry pulp. Boil rapidly to make a light-colored jam, or slowly to make a deep-red jam. When of the desired thickness, pour into sterilized jars and seal. By the use of a fruit-pulp machine, similar to a food grinder, the skins and seeds may be removed from the gooseberry pulp, either before cooking or after the gooseberries have been softened by cooking a short time. This will make "topping and tailing" unnecessary, but the resulting jam is less palatable to some.

Currant jam.—Currant jam is made in the same manner as gooseberry jam. The seeds, however, should be removed with the pulp machine or the fruit should be pressed through a colander.

Gooseberry-currant jam.—Very good combinations may be made by using one-half each of gooseberries and currants or a larger or smaller quantity of either, according to the supply. The currant seeds should, of course, be removed. Otherwise, the jam is made according to the directions for gooseberry jam.

Gooseberry-blackberry jam.—In making the combination of gooseberries and blackberries for jam, equal quantities of each fruit or two-thirds blackberries and one-third gooseberries may be used. The blackberries should be mashed, added to the mashed gooseberries, and the jam made according to the directions for gooseberry jam.

Raspberry-currant jam.—Equal quantities of raspberries and currants are used for raspberry-currant jam. Extract the currant seeds before cooking and proceed as above.

Black-currant jam.—This jam should be made according to the directions for making gooseberry jam except that it will be necessary to add considerable water before cooking. It is sometimes recommended that rhubarb be added in the proportion of one part of rhubarb to four parts of currants.

UNFERMENTED JUICES.

While unfermented juices made from gooseberries and currants are not generally used, they are desirable for home purposes. They can be used either separately or combined with each other or with the juices of other fruits.

Use sound, clean, ripe currants and unripe gooseberries. Extract the juice as for jelly making. Strain through a flannel cloth and place in bottles or fruit jars. Put the jars or bottles in a water bath and heat the juice almost to the boiling point, but do not boil. A temperature of 180° F. is desirable. Hold the juice at this temperature for 30 minutes; then remove from the water and seal. The juice should be stored in the coolest place available, as, unless made with black currants, it gradually loses its color and flavor if kept at living-room temperatures.

Preparation for use.—Some sugar should be added to the juice before bottling, or the juice should be reheated and sweetened before using, as juice without sugar or juice to which sugar has been added while cold usually has an unpleasant aroma. Water should be added before using, as the juice is entirely too acid to be used undiluted.

OTHER PRODUCTS.

Currants and gooseberries are used for making conserves, preserves, pastes, marmalades, spiced products, catsups, and for canning. Gooseberry tarts and pies made of green gooseberries or green currants are especially popular.

SUMMARY OF STATE LAWS[22] CONCERNING CURRANTS AND GOOSEBERRIES IN RELATION TO BLISTER-RUST CONTROL.[23]

Connecticut.—The law authorizes the proper State authorities to enter upon any public or private property in the performance of their duties; to uproot and destroy all currant and gooseberry bushes and white pines infected with the blister rust; to designate districts within which all currant and gooseberry bushes growing wild, abandoned, or escaped from cultivation may be uprooted and destroyed;[24] and to maintain quarantines against other States or any designated area within the State.

Idaho.—Black currants (*Ribes nigrum* and its varieties) are proclaimed a public nuisance, and it is unlawful to possess or sell them. Horticultural inspectors are ordered to condemn and destroy any black currants in the State. The law provides that plants which are known to be hosts of any injurious disease shall be eradicated by

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[22] For quarantine regulations, see Table 1 (p. 37).

[23] Compiled by Maude A. Thompson, Office of Blister-Rust Control, Bureau of Plant Industry, October 1, 1923.

[24] Local control areas in which currant or gooseberry bushes growing wild, abandoned, or escaped from cultivation may be destroyed: Litchfield County, the towns of Barkhamsted, Canaan, Colebrook, Norfolk, North Canaan, Salisbury, Sharon, Torrington, and Winchester.

the owner or person in charge of the property concerned when officially notified to do so. In case he fails to perform such work in the time specified the State is authorized to destroy the designated plants, the expense becoming a legal charge upon the property.

Maine.—Currant and gooseberry plants and white pines infected with the blister rust are declared a public menace, and the Forest Commissioner and his representatives have the right to enter upon any private or public lands within the State and destroy any such plants or any wild currant or gooseberry bushes. Control areas may also be designated in the State, within which landowners may be required to destroy currant and gooseberry bushes and white pines infected with the blister rust and on failure to do so are taxed the cost of removal. Within these control areas the commissioner and his representatives may also order the destruction of the above-named plants, even though not infected with the blister rust.[25] The State nursery inspector is also authorized to enter upon any land in the vicinity of a nursery and to enforce measures of control or eradication of plant pests, including white-pine blister rust.

Massachusetts.—The law provides for the destruction of all currant and gooseberry bushes and five-leafed pines infected with the blister rust or so situated as to be liable to infection. Officials of the Division of Plant Pest Control, Department of Agriculture, are authorized to enter upon any public or private property in the performance of their duties.

Minnesota.—The State nursery inspector is authorized to inspect any premises within the State where the presence of injurious plant pests is suspected. If a dangerous pest is found, the inspector may direct the owner to destroy the plants; and if he fails to do so, the State may destroy them at the expense of the owner. When any undiseased plant or tree which is a host for any organism inducing a plant disease not widely prevalent throughout the State is situated within 3,000 feet of any tree or plant infected with such organism, the State nursery inspector may cause the undiseased plant to be destroyed.

New Hampshire.—Currant or gooseberry bushes or white pines infected with the blister rust are declared a public pest, and the State forester and his authorized agents have the right to enter upon any public or private land and destroy such diseased plants, as well as all wild currant and gooseberry bushes. The State forester is empowered to designate control areas within which landowners may be required to destroy currants, gooseberries, and white pines infected with blister rust. Within such control areas no person shall plant currants, gooseberries, or white pines unless the permission of the State forester is first obtained. Within the control areas, the State forester may also cause the destruction of the above-named plants, even though not infected with the blister rust.[26] The State nursery inspector has the same authority as the State forester in the control and eradication of hosts plants of the blister rust in the vicinity of any nursery within the State.

New York.—The black currant (including *Ribes nigrum*, *R. odoratum*, and *R. aureum*) is declared a public nuisance and its growth

[25] Control areas for the year 1923 include all towns in York County and certain towns in the counties of Androscoggin, Cumberland, Oxford, and Sagadahoc.

[26] The control areas in 1923 include certain towns in every county in the State.

within the State is prohibited except undiseased *Ribes nigrum* in "fruiting-currant" districts.[27] Within such designated districts all diseased bushes may be destroyed and all five-needle pines may be cut down and their growing prohibited. No currant or gooseberry, including any flowering currant, may be brought into or grown in the following areas:

In Clinton County: Towns of Ausable, Black Brook, and Peru.
In Columbia County: All of the county except Chatham, Ghent, Claverack, Livingston, Gallatin, Clermont, Germantown, Greenport, Stockport, Stuyvesant, and Kinderhook.
All of Essex County.
Niagara County: Towns of Porter, Lewiston, and Niagara.
Rensselaer County: Towns of Berlin, Petersburg, and Stephentown.
All of Warren County.
All of Adirondack Park and Catskill Park.

Oregon.—The cultivated black currant (*Ribes nigrum*) is declared a public nuisance, and it is unlawful to grow, propagate, or distribute this plant in the State. Commissioners of the State Board of Horticulture and State and county inspectors are vested with power to abate the nuisance in a summary manner.

Pennsylvania.—The Secretary of Agriculture, through the State nursery inspector, or his deputies, may enter upon and inspect any public or private property which might become infected with harmful plant pests. The Secretary of Agriculture is empowered to prescribe and enforce such reasonable orders as may be needed to carry out the provisions of the law. Trees, plants, shrubs, or other plant material infested or infected with injurious plant pests shall be deemed a public nuisance. It is unlawful for any person in the State knowingly to permit any destructive or dangerously harmful insect or plant disease to exist on his premises.

Rhode Island.—It is unlawful to plant black currants or flowering currants in the State. Other currant and gooseberry bushes and five-leafed pines may be planted only under permit of the State Board of Agriculture, Providence, R. I. Blister rust is declared a public nuisance, and the State Board of Agriculture has authority to make such rules as are deemed necessary to exterminate it, including the destruction of diseased or exposed currants and gooseberries and diseased or exposed five-leafed pines. The board may enter upon any private or public lands in carrying out its purpose. It is also authorized to govern the transportation of currant and gooseberry plants and five-leafed pines.

Vermont.—The Commissioner of Agriculture may use such means as are deemed necessary to exterminate or prevent the introduction of threatening or unusual fungous diseases. He may designate and take control of certain areas to prevent the spread of a plant disease and, within such areas, may destroy the host of any plant disease. He or his agents may enter upon public or private land in the performance of their duties.

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[27] Three "fruiting-currant" districts have been established: (1) *In Chautauqua County.*—The following townships, bordering on Lake Erie, except that portion of the town of Hanover lying south of the Alleghany Division of the Erie Railroad: Ripley, Westfield, Portland, Pomfret, Dunkirk, Sheridan, and Hanover. (2) *In Orange and Ulster Counties.*—A small portion of Orange County east of Ashokan Aqueduct and a tract in the southeastern part of Ulster County. Detailed descriptions of these tracts may be obtained from the Conservation Commission, Albany, N. Y. (3) *In Columbia County.*—The following towns: Chatham, Ghent, Claverack, Livingston, Gallatin, Clermont, Germantown, Greenport, Stockport, Stuyvesant, and Kinderhook.

Washington.—Cultivated black currants may not be planted, grown, or shipped within the State. It is the duty of every owner, lessee, or occupant of land on which any horitcultural plant exists to use sufficient means for preventing infection by plant pests, and in case the plants become infected and can not be successfully disinfected to promptly destroy them. This requirement applies to such bacterial and fungous diseases and pests as may be specified as injurious to horticulture in circulars issued by the State Department of Agriculture.

Wisconsin.—The State Department of Agriculture has designated all wild and cultivated currant and gooseberry bushes as carriers of white-pine blister rust. The department may, in its own discretion, or on petition of owners of 10 per cent of the land contiguous to a given area, or on resolution of a town meeting, designate control areas within which reasonable arrangements are made for cooperating with owners in the destruction of currant and gooseberry bushes for the protection of the white pine; and the planting or harboring of such bushes within the area is thereafter prohibited. This does not prohibit the planting or growing of currants and gooseberries outside the designated control areas. The department may destroy white-pine trees growing within 1,800 feet of currant and gooseberry bushes infected with the midsummer stage of the blister rust, when such action appears necessary to control the spread of the disease.

FEDERAL AND STATE QUARANTINE REGULATIONS GOVERNING THE MOVEMENT OF CURRANT AND GOOSEBERRY PLANTS.

FEDERAL QUARANTINES (FOREIGN).

Federal quarantine No. 7.—As amended, quarantine 7 prohibits the importation of all species and varieties of currants and gooseberries [28] (Ribes and Grossularia) from each and every country of Europe and Asia and from the Dominion of Canada and Newfoundland.

FEDERAL QUARANTINES (DOMESTIC).

Federal quarantine No. 26.—As amended, quarantine 26 prohibits the interstate movement of all kinds of currant and gooseberry plants [28] from States east of, and including, Minnesota, Iowa, Missouri, Arkansas, and Louisiana to points outside the area; and prohibits the interstate movement of black currants [29] from the area comprised by the New England States and New York to points outside; and, to protect the State of New York, prohibits the shipment of black currants from the New England States into New York.

Federal quarantine No. 54.—As extended, quarantine 54 prohibits the movement of all kinds of currant and gooseberry plants [28] from the State of Washington to any outside point.

[28] The movement of five-needle pines is also governed by these Federal quarantines, as well as by quarantines of many of the States. Persons interested in obtaining white pines from outside their State should consult the State nursery inspector or the Federal Horticultural Board, Washington, D. C., for information concerning quarantine restrictions.

[29] The Federal Horticultural Board interprets the term "black currants" to include all currants having black fruit, including *Ribes nigrum*, *R. aureum*, and *R. odoratum*.

DIGEST OF STATE AND FEDERAL QUARANTINES.

TABLE 1.—*Regulations governing the interstate movement of currant and gooseberry plants into each State.*

[Persons living in States listed in column 1 must not bring in prohibited plants (column 2) from the States given in column 3.]

State.	Plants prohibited.	Quarantined territory: Prohibited plants must not be moved from these States into the State shown in column 1.
1	2	3
Alabama	Black currants	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
Arizona	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
Arkansas	Black currants	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
California	do	Washington, and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
Colorado	do	Do.
Connecticut	do	Washington (see also p. 33).
Delaware	do	New England, New York, New Jersey, Pennsylvania, Ohio, Wisconsin, Minnesota, Michigan, and Washington.
District of Columbia	Black currants	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
Florida	Black currants	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
Georgia	do	All other States.
Idaho	Black currants	Quarantined against entry from any source and may not be moved within the State (see also p. 33).
	All currants and gooseberries.	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
Illinois	do	New England and Washington.
	Black currants	New England, New York, New Jersey, Pennsylvania, Ohio, Michigan, Minnesota, Wisconsin, and Washington.
Indiana	do	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
Iowa	Black currants	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
Kansas	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
Kentucky	Black currants	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
Louisiana	Black currants	New England, New York, and Washington.
	All currants and gooseberries.	Washington.
Maine	do	Quarantined against entry into Maine from any other State and may not be shipped from point to point within the State (see also p. 34).
Maryland	do	New England, New York, Illinois, Michigan, Minnesota, New Jersey, Pennsylvania, Wisconsin, and Washington.
Massachusetts	do	Washington. Currants and gooseberries can not be brought into Massachusetts from any source except under permit of the State Commissioner of Agriculture, 136 State House, Boston, Mass.[1] (see also p. 34).
Michigan	Black currants	New England, New York, New Jersey, Pennsylvania, Minnesota, Wisconsin, and Washington.
	Red and white currants	Special permit must be obtained from the State Inspector of Nurseries and Orchards, Lansing, for bringing in red and white currants from New England, Minnesota, Wisconsin, and New York, except that such plants grown in or about Dansville, Fredonia, Geneva, Newark, or Rochester, N. Y., may enter Michigan without permit if a certificate of inspection is attached.
	All currants and gooseberries.	Washington.
Minnesota	Black currants	New England, New York, Pennsylvania, Ohio, New Jersey, Michigan, Wisconsin, and Washington (see also p. 34).
	All currants and gooseberries.	Washington. Must not be shipped to Minnesota from the above States unless they are stripped of leaves. New England, New York, and Washington.
Mississippi	Black currants	
	All currants and gooseberries.	Washington.

[1] Applicant must agree not to ship the plants into the following towns: Athol, Barre, Boxford, Dana, Duxbury, Halifax, Hanover, Hanson, Hubbardston, Ipswich, Lakeville, Lee, Lenox, Marshfield, Middleboro, Newburyport, North Andover, Orange, Pembroke, Petersham, Phillipston, Stockbridge, Topsfield, Warwick, and Winchendon.

TABLE 1.—*Regulations governing the interstate movement of currant and gooseberry plants into each State*—Continued.

State.	Plants prohibited.	Quarantined territory: Prohibited plants must not be moved from these States into the State shown in column 1.
1	2	3
Missouri	Black currants	New England, New York, and Washington.
	All currants and gooseberries	Washington.
Montana	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana
Nebraska	do	Do.
Nevada	do	Do.
New Hampshire	do	Quarantined against entry into New Hampshire from any other State or against movement within the State (see also p. 34).
New Jersey	Black currants	New England, New York, and Washington.
	All currants and gooseberries	Washington.
New Mexico	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
New York	Black currants	New England and Washington.
	All currants and gooseberries	Washington. (See also p. 34.)
North Carolina	do	New England, New York, New Jersey, Pennsylvania, Ohio, Michigan, Minnesota, Wisconsin, Washington, or any other State infected with blister rust.
North Dakota	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
Ohio	Black currants	New England, New York, and Washington.
	All currants and gooseberries	Washington.
Oklahoma	do	Washington and all States east of and including Min nesota, Iowa, Missouri, Arkansas, and Louisiana.
Oregon	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana (see also p. 35).
Pennsylvania	Black currants	Quarantined against entry from any other State (see also p. 35).
	All currants and gooseberries	Washington.
Rhode Island	do	Washington. (See also p. 35.)
South Carolina	do	All other States.
South Dakota	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.
Tennessee	do	Do.
Texas	do	Do.
Utah	do	Do.
Vermont	do	Washington. (See also p. 35.)
Virginia	Black currants	New England, New York, and Washington.
	All currants and gooseberries	Washington.
Washington	Black currants	Not to be shipped or planted or grown within the State. (See also p. 36.)
	All currants and gooseberries	All States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana; and no State may ship into that portion of Washington west of the Cascade Range.
	Currants and gooseberries, other than black currants	Not to be shipped from that portion of Washington west of the Cascades into the rest of the State, except by licensed and inspected nurseries and unless the plants are stripped of leaves.
West Virginia	All currants and gooseberries	All other States.
Wisconsin	Black currants	New England, New York, and Washington.
	All currants and gooseberries	Washington. (See also p. 36.)
Wyoming	do	Washington and all States east of and including Minnesota, Iowa, Missouri, Arkansas, and Louisiana.

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